this great factor in protective resemblance. The artist in him first saw the well-nigh ever-present effects, and then found the cause, which, indeed, had been suggested some years earlier by one who failed to recognise its far-reaching importance and thus missed a great discovery.

Thayer's artistic temperament also led him to resent any limits to the application of his principles and to attempt to explain by them all examples of warning and mimetic coloration. When the review of the first edition of his work, "Concealing Coloration in the Animal Kingdom," appeared in NATURE (1910), it was many months before he could bring himself to read it. Yet when at length he made the effort he was pleased, and wrote a kindly letter to the reviewer.

Science needs the help of such men whose approach is from a widely different point of view, and science owes much to Thayer and will gratefully preserve his memory. E. B. P.

THE death is announced, at eighty-three years of age, of PROF. VIKTOR VON LANG, formerly professor of physics at Vienna University and a past-president of the Austrian Academy of Sciences.

Notes.

AT the meeting of the Royal Society of Edinburgh held on Monday, July 4, the following were elected honorary fellows:—*British Honorary Fellows:* William Henry Perkin, Sir Ronald Ross, Sir Ernest Rutherford, and Sir Jethro J. H. Teall. *Foreign Honorary Fellows:* Reginald Aldworth Daly (Cambridge, Mass.), Johan Hjort (Bergen), Charles Louis Alphonse Laveran (Paris), Heike Kamerlingh Onnes (Leyden), and Salvatore Pincherle (Bologna).

THROUGH the generosity of the Rev. Dr. Winifrith, of Hythe, a memorial tablet has just been placed on the house—31 High Street—in that town in which Sir Francis Pettit Smith was born. Of all the numerous inventors of screw propellers, Smith, perhaps, is the best known. Born in 1808, he began life as a farmer, but was always given to mechanical invention. His first patent for a screw propeller was dated May 31, 1836, and his screw was first fitted in the *Francis Smith,* and then in the epoch-making vessel s.s. *Archimedes.* Brunel was among the converts to Smith's ideas, and he discarded paddle wheels for the *Great Britain,* which, in 1845, was the first screw-driven vessel to steam across the Atlantic. The same year the screw sloop, H.M.S. *Rattler,* was added to the Navy List, and for some years afterwards Smith was employed by the Admiralty installing his screws in the converted line of battleships, many of which were in service in the Crimean War. He made little money out of his invention, but the shipbuilding and marine engineering world in 1858 raised a subscription of nearly 3000*l.* for him, and gave him the fine silver salver and jug which are in the Science Museum. During the latter part of his life—he died in 1874—Smith was curator of the Patent Office Museum.

GLASGOW UNIVERSITY, in accordance with the policy of establishing separate buildings for its scientific departments which was initiated by the erection of the Botanical Institute, has signed a contract for a zoological building, which has been planned by Prof. J. Graham Kerr and the architects, Messrs. John Burnet, Son, and Dick. The building will be near the new medical department on part of the former athletic ground. It will cover 3000 square yards, and include a lecture-room with accommodation for 260 students, an elementary laboratory with tables for 150 students, and special laboratories for advanced work, protozoology, research, and experimental zoology. There will be a large museum, to which will be transferred the zoological collections now in the Hunterian Museum, leaving space there for extensions of the departments of geology and archæology. Above the museum will be two large tank-rooms for living marine specimens, and land animals will be accommodated in a courtyard. A room will be provided for the departmental library and a suite of rooms for the staff. The building is estimated to cost 130,000*l.*, and it is hoped that the lecture-rooms and laboratories will be ready for the winter session of 1922–23. Under Prof. Graham Kerr the zoological department of Glasgow University has achieved great success, and it will now have a building worthy of its important work.

THE attention of French archæologists is now being devoted to an important series of discoveries in tombs at Martres-de-Veyre, Auvergne, which, according to M. Salomon Reinach, "are in an unprecedented state of preservation. In my experience there has never been found anywhere so many articles of leather, of wool, and of other stuffs in such good condition after being buried in graves for 1800 years." Near this necropolis is the famous fortress of Gergovia, where Vercingetorix won some temporary success against Cæsar, practically the last revolt against the Romans. The extraordinary state of preservation of the bodies found in the six tombs now brought to light calls for explanation. The body of a Gallo-Roman woman interred in a stone coffin lay as if life had only just departed, but on being exposed to the air it suddenly crumbled into dust. Ornaments and articles of the toilet were found in great abundance, while a jar of honey, vases, leather sandals, and linen and woollen fabrics were among the furniture of the graves. The articles discovered have been deposited in the museum at Clermont-Ferrand, the capital of the Department of Puy-de-Dôme, the Paris museums having wisely decided not to enter into competition with the local collections. It may be hoped that careful excavation in this district will lead to further important results.

IN the James Forrest lecture delivered on June 28 Sir George Beilby presented a review of the world's fuel situation. Coal, brown coal, peat, oil from wells and from oil-shales, and alcohol are discussed, and the conclusion is reached that coal is likely to remain for a long time the world's chief source of fuel. Brown coal and peat are dismissed on account of the vast areas of land which are required in order to obtain adequate supplies and prepare them for use. Oil amounts to 7 per cent. of the fuel output of the world, and nearly nine-tenths of this quantity is controlled by the United States. The conclusion of the chief petroleum technologist of the U.S. Bureau of Mines, that after twenty years at the present rate of consumption the output will decline, is therefore of importance, though there is reason to expect production from oilfields in other parts of the world which have not as yet been tapped. The only method available in Great Britain for the commercial preparation of alcohol is by the fermentation of vegetable materials containing starch or sugar. Even this method, however, is not economically possible owing to the lack of available land for the cultivation of the crops required, the high cost of cultivation, harvesting, and manufacture, and the fact that the most suitable raw materials are also important foodstuffs. Some alcohol may be produced from molasses in countries where the sugar-cane is grown, but it is unlikely that more than is required for local use can be made. Falling back on coal, it is suggested that more efficient use may be secured by careful sorting at the pitheads, by improvements in boiler-firing, and by preliminary carbonisation at high or low temperatures.

The *Daily Chronicle* announces that Prof. Edouard Branly, of Paris, is to receive this year's Nobel prize for physics.

It is stated in the *Times* that the directors of the Nobel Foundation have submitted a proposal to the Swedish Government for increasing the value of the Nobel prizes by transferring a sum of about 100,000*l.* from their building fund.

We learn from the *Times* that the French Société de Géographie is celebrating its centenary. There was a reception for delegates at the house of Prince Roland Bonaparte, president of the society, on Tuesday night, and in the afternoon M. Millerand, President of the French Republic, presided at the opening meeting of the celebration, a gathering at which explorers and geographers from various parts of the world were present.

The sixty-sixth annual exhibition of the Royal Photographic Society of Great Britain will be held on September 19–October 29 at 35 Russell Square, W.C.1. There will be three sections, devoted respectively to pictorial photographs, to colour transparencies and colour prints, and to scientific and technical exhibits, natural history photographs, and lantern and stereoscopic slides.

A circular has been issued by the Meteorological Office with reference to the summer service of forecasts of weather for agricultural purposes. Notification is given by telegraph of occasions when a spell of fair settled weather of several days' duration is anticipated. The progress of meteorological events and warning of the break-up of the fine spell are sent to the recipient as early as possible. The fee beyond the telegraphic charge is extremely small. Notification is also given of special conditions, such as spells of frost, ground-frost, smooth sea, etc.

By invitation of Messrs. Sutton and Sons and of Prof. Percival, a field-meeting of the Association of Economic Biologists will be held at Reading on Thursday, July 14. Visits will be paid to the Royal Seed Establishment, the Trial Grounds, and the College Farm and Agricultural Botanic Gardens. It is requested that all who propose to attend the meeting will notify Mr. W. B. Brierley, the Rothamsted Experimental Station, Harpenden, not later than Monday, July 11.

Beginning on June 15, the wireless telegraph station at Poldhu is sending weather messages broadcast twice daily for the benefit of navigators. Each message will consist of a forecast for the western seaboard of the British Isles and the actual observations taken at Stornoway, Blacksod, Holyhead, Scilly, and Dungeness at 0700 G.M.T. (civil) and 1800 G.M.T. (civil) respectively. The messages will be sent out at 0930 G.M.T. (civil) and 2130 G.M.T. (civil). Details of the scheme are given on the Meteorological Chart of the North Atlantic Ocean for July.

A Norwegian scientific expedition is leaving this summer for the island of Jan Mayen, in the Greenland Sea. According to *La Géographie* for May, the expedition will consist of six or seven persons, under the command of Mr. Ekerold. The main object is meteorological research, and it is hoped that the work of the party will lead to the foundation of a permanent observatory on Jan Mayen. A wireless telegraph station is to be erected. The last serious effort in meteorological research at Jan Mayen was in 1882–83, when an Austrian station, as part of the international scheme, was maintained on that island.

We are glad to learn that Lyme Regis, a town classic in geology, is now provided with a public collection of local fossils. Three years ago a small museum building was bequeathed to the corporation by the late Mr. Philpot, and it is now occupied by the geological collection and library of Dr. Wyatt Wingrave, who has lately become a resident of the town, and has devoted much labour to making the museum of educational value. The fossils are arranged in stratigraphical order, with appropriate explanatory labels and diagrams, and Dr. Wingrave gives a weekly demonstration which is well attended and much appreciated.

H.R.H. the Prince of Wales has accepted the office of vice-patron of the Royal Society of Arts. The following medals have been awarded for papers read before the society during the past session:—Major-Gen. Lord Lovat, "Forestry"; Col. R. J. Stordy, "The Breeding of Sheep, Llamas, and Alpacas in Peru, with a View to Supplying Improved Raw Material to the Textile Trades"; A. F. Baillie, "Oil-burning Methods in Various Parts of the World"; Dr. W. Cramp, "Pneumatic Elevators in Theory and Practice"; Sir Kenneth Weldon Goadby, "Immunity and Industrial Disease"; W. Raitt, "Paper-pulp Supplies from India"; Sir George Curtis, "The Development of Bombay"; A. H. Ashbolt, "Industrial Development in Australia during and after the War"; and Sir Charles H. Bedford, "Industrial (including Power) Alcohol."

We have received a communication from Mr. W. J. Lewis Abbott in reference to a statement made in the course of the discussion on Mr. Reid Moir's paper on "An Early Chellean Palæolithic Workshop-site at Cromer," which took place at a meeting of the Royal Anthropological Institute (see Nature of May 26, p. 406). In that discussion one of the speakers stated that the flints in question were "no more than a foreshore accumulation of flints which differed in no way from other flints found on the foreshore along the whole East and South Coast." Mr. Abbott directs attention to the distinctive coloration of the Cromer specimens, of which there are three types: (1) Those which are porcellanised or whitened; (2) those exhibiting the characteristic orange-red colour; and (3) specimens which have been changed from white to black, the white porcellanous condition being present under the black. He maintains that this peculiar feature cannot be due to beach action. In regard to the evidence for dating the finds, Mr. Abbott states that he has discovered specimens in association with remains of *Elephas* (?) *meridionalis*, in one case *in situ*. The question of the coloration of the Cromer flints is one of considerable difficulty, for which no satisfactory explanation has yet been offered, while in regard to the stratigraphical evidence, it is clear that a systematic investigation at the base of the Forest Bed series on this site, as suggested by Mr. Reid Moir himself, is extremely desirable.

"Sun-spots and Weather" is the title of an article in the *Meteorological Magazine* for June, dealt with by Mr. C. E. P. Brooks. It is mentioned that the subject is again opened by the recent development of an unusually large sun-spot with associated electrical and magnetic phenomena. A bibliographical list is given of authorities on the subject, and the author states that although the literature is enormous, we are still far from definite conclusions. So long ago as 1651 Riccioli claimed that temperature rose with decreasing sun-spots and *vice versa*. The discovery in 1844 of an eleven-year periodicity in spots caused a renewal of the study, and in 1873 results of an investigation by Köppen were published showing that temperature reaches a maximum shortly before spot minimum and a minimum about spot maximum. A positive correlation of sun-spots with rainfall has been found in the tropics, and also with elements such as lake levels which depend on rainfall. A close parallelism has been demonstrated between sun-spots and tropical hurricanes, and the author states that the study of eleven years' wind data in the Falkland Islands suggests that at spot maximum the storminess is greatest.

Popocatapetl exhibited only slight activity in the way of fumaroles and solfataras in the two centuries that followed the eruption of 1720. In 1920, however, small eruption-clouds became visible from Mexico City, and Mr. Paul Waitz has described an ascent made by him in October last (*Amer. Journ. Sci.*, vol. cci., p. 81, 1921). Considerable outbursts of steam were then taking place from the crater, accompanied by a small quantity of stones and ashes, and it appears that the old central plug of 1720, formerly concealed by a lakelet, is now being pushed upward in the crater-floor. Two fine photographs accompany the paper, one of which is here reproduced.

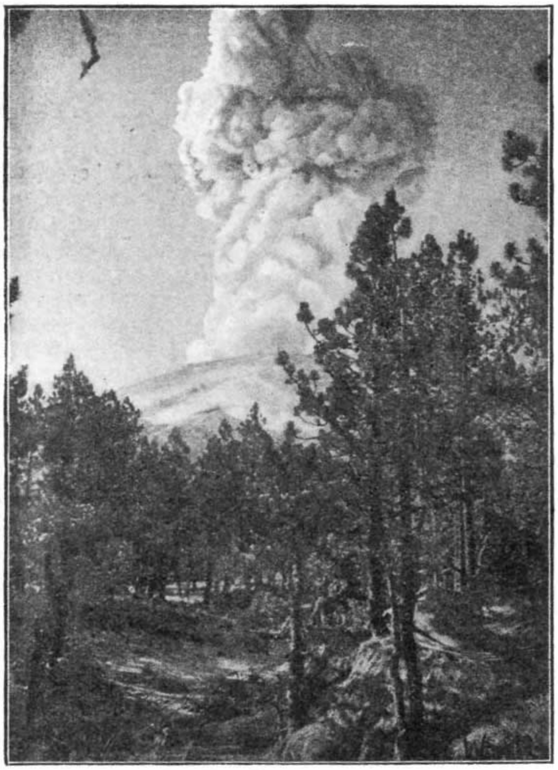


Fig. 1.—Cauliflower clouds of a steam eruption of Popocatapetl, October 12, 1920. From the *American Journal of Science*, January, 1921.

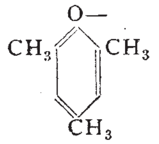
The current issue of the Journal of the Institute of Petroleum Technologists contains, among other papers, some interesting details by Capt. Paul H. Mangin on boring in Palestine in search of water during the progress of military operations from 1917 to 1919. Although both drilling *personnel* and equipment were initially somewhat crude, very creditable results were achieved, no less than a gross total of 5500 ft. being drilled in the putting down of forty-five wells, from which something like 1,500,000 gallons of water per day were obtained. The area in which the wells were sunk borders the coast between the Egyptian frontier (at Rafah) and Mount Carmel on the north. The chief difficulties encountered apart from those mentioned were the loose nature of the sands penetrated and the prevention of their caving in and blocking up the hole. Five types of drilling rig were used, but the best results were obtained by the hydraulic percussion system with mud flush. An important feature of the work was the excellent log kept of each well, which, together with samples of the formations met with, have been preserved for future reference. Although having no direct bearing on oil, the results of this work are of great interest to petroleum technologists generally, and also presumably to those who are optimistic enough to believe in Palestine as a potential oilfield.

PART 2 of vol. xxii. of the Transactions of the Optical Society contains the address of the president, Mr. R. S. Whipple, which deals with the design and construction of scientific instruments. Such instruments must have as their principal characteristic the property of giving results of a constant prescribed accuracy, and all the important sources of inaccuracy in them should be known. Errors should be capable of elimination by adjustment of the instruments themselves, or if elimination is not possible, they should be measurable by the instruments. The design of an instrument involves the consideration of the magnitudes of the errors to which it may be liable, and it is this preliminary survey which prevents the cost of manufacture being increased by the removal of insignificant errors while others more serious are allowed to remain. Examples of well-designed slides, rotating parts, screws, and nuts are given, and it is clearly shown why they are good. A nut of unsound design used on gun clinometers which the authorities preferred to one designed on geometrical principles is also shown. The address will repay reading by all instrument-makers who wish to meet the new demand for scientific instruments in industry.

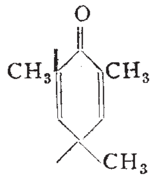
THE fourth report of the Conjoint Board of Scientific Societies shows that the board has received evidence that scientific investigation is being seriously hampered by the heavy cost involved in the publication of results. An exceptional number of papers is being communicated to the scientific societies, including many held up during the war, while the resources of the societies, which have not increased, are insufficient at present prices to publish even the normal pre-war number. The country is thus in danger of being seriously handicapped at a time when the rehabilitation of industry is in most serious need of scientific assistance. Much of the report is occupied with an abstract of the third report of the Committee on the Water-Power Resources of the Empire. It is shown that too little is being done to ascertain the total resources or to secure uniformity in investigation and record. It is urged that steps should be taken to convene an Imperial Water-Power Conference in London, at which the various Dominions and Dependencies of the Empire should be represented. The outcome of such a conference might well be the creation of an Imperial Water-Power Board, with extensive powers to carry out a comprehensive policy for stimulating, co-ordinating, and, where necessary, assisting development throughout the Empire. The board has also dealt with questions relating to the formation of national research committees in connection with the International Research Council formed in 1919, with the collection of scientific data in the former German colonies, and with instruction in technical optics. The research on glues and other adhesives initiated by the board as a war measure, at the instance of the Air Ministry, has now been taken over by the Department of Scientific and Industrial Research.

THE trials of the motor vessel *Yngaren* were run successfully off the Tyne on Tuesday, June 14, and an account appears in *Engineering* for June 24. The main engine of this vessel is of the opposed piston type, with four cylinders 22·8 in. diameter by twice 45·6 in. stroke. When running at its normal speed of 77 revs. per min. the engine develops 3000 indicated horse-power (2700 brake horse-power), or 675 brake horse-power per cylinder, and is therefore the highest-powered Diesel cylinder as yet installed in any ship. The ship is also notable on account of having but one propeller. In view of the large power per unit and of there being but one engine, the designers were conservative, and the metal and sections are more than ample for the working stresses, with a large factor of safety. The weight of the main engine is 375 tons, and of the whole installation 600 tons. Starting is exceptionally easy to accomplish, and contributory to this result are hot pistons and hot jackets. During the sea trials the outlet temperatures from the pistons and cylinder jackets were 140° to 160° F. The fuel injection into the main engine cylinders works on the solid injection principle, and is effected at pressures of 8000 to 10,000 lb. per sq. in. at full power and speed.

THE preparation of a compound which may contain univalent oxygen is announced by C. W. Porter and F. H. Thurber, of the University of California, in the April issue of the Journal of the American Chemical Society. The substance is obtained by the oxidation of mesitol (2 : 4 : 6-trimethylphenol) by silver oxide. A red crystalline product was obtained, the molecular weight of which indicated that it contained in combination equimolecular amounts of unoxidised mesitol and an oxidation product corresponding to one of the formulæ:



or



It may, therefore, contain either univalent oxygen or tervalent carbon. It is reduced to a saturated product by the addition of an uneven number of hydrogen atoms, indicating that it contains an odd electron, and has therefore the characteristic properties of a free radical.

IN consequence of the greatly increased cost of production, the Association of Economic Biologists has issued an appeal for financial assistance towards the publication of the eighth volume of the *Annals of Applied Biology*. In order that the present standard of quality of the *Annals* may be maintained, it is necessary that the sum of 250*l*. should be raised. Workers in applied biology are therefore earnestly invited to contribute to the appeal fund. Any contribution, however small, will be acceptable, and should be sent to the honorary treasurer of the association, Dr. A. D. Imms, Institute of Plant Pathology, Rothamsted Experimental Station, Harpenden.

MESSRS. MACDONALD AND EVANS, 29 Essex Street, W.C.2, are about to begin, under the editorship of Mr. G. W. de Tunzelman, the publication of a new series of manuals entitled "The Reconstructive Technical Series," the aim of which is to diffuse the new knowledge and enlarged technical skill gained during recent years, and so to make it available for to-day as a means towards greater all-round efficiency and increased competitive power in the world's markets. The first volume—"Engineering Steels: An Exposition of the Properties of Steel for Engineers and Users to Secure Economy in Working and Efficiency of Result," by Dr. L. Aitchison—will be published almost immediately.

IN recent correspondence on the subject of picture-hanging wire, copper or brass wire has been recommended. Mr. N. M. Richardson now writes to condemn these materials for this purpose on account of the brittleness which develops in the course of a few years. He advises the use of galvanised iron wire, which can be painted a suitable colour if desired. Such wire has been found to be very trustworthy and permanent unless it is exposed to damp.

ADMIRERS of the late Sir William Abney will be interested to learn that the Abney memorial lecture by Mr. Chapman Jones (delivered before the Royal Photographic Society of Great Britain on April 26 last) is printed in full in the July issue of the *Photographic Journal*. Copies of the journal are obtainable from the publishers, Messrs. Harrison and Sons, Ltd., 45 St. Martin's Lane, W.C.2, or the Society, 35 Russell Square, W.C.1.

WE have received from Mr. R. S. Frampton, 37 Fonthill Road, N.4, a catalogue (No. 26, 1921) of second-hand books dealing with science—mainly natural history and gardening. Some 1056 works are listed, and the prices asked are low. The catalogue is obtainable upon application to the bookseller.

MESSRS. GEORGE BELL AND SONS, LTD., announce the publication by them in the autumn of a full report of the proceedings of the Congress of the Universities of the Empire now in progress.

Our Astronomical Column.

THE CAPE OBSERVATORY.—Expression is given by Sir Joseph Larmor, in a letter to the *Times* of July 4, to the apprehensions that are felt among astronomers as to the effect of the proposed transference of the Cape Observatory from the Admiralty to the South African Government. Judging by the condition of the Australian observatories, which at all stages of their existence, and never more than at present, have been greatly hampered through lack of funds, the change would not be to the advantage of astronomy. Further, the suggested transfer would greatly weaken the close bond of reciprocity that has from the first linked the Greenwich and Cape Observatories. It is greatly to be desired that the proposal, which would be little short of a disaster to astronomy, may yet be averted.

THE COMET PONS-WINNECKE.—This comet has now passed out of sight of northern observers, but ephemerides have been sent to southern observatories, where it may be observed for two or three months more. Mr. G. Merton has revised the orbit by using observations extending from April 12 to June 2. He finds

$$\begin{aligned} T &= 1921 \text{ June } 12{\cdot}8985 \text{ G.M.T.} \\ \left.\begin{aligned} \omega &= 170^\circ\ 12'\ 34'' \\ \text{☊} &= 98^\circ\ 12'\ 37'' \\ i &= 19^\circ\ 1'\ 7'' \end{aligned}\right\} & 1921{\cdot}0 \\ \log a &= 0{\cdot}52957 \\ e &= 0{\cdot}69242 \\ q &= 1{\cdot}0411 \end{aligned}$$

The most uncertain element is log a, for which the above value is almost certainly too large. It gives a period of 6·23 years, whereas the true value is unlikely to exceed 5·93 years. But the other elements would not be greatly altered by this change.

Mr. Denning writes:—"On the night of June 28 I saw some bright meteors, several of which presumably belonged to the shower from Pons-Winnecke's comet. It is desirable to procure duplicate observations of these objects if possible, for the purpose of working out their real paths, and ascertaining whether or not their radiant points nearly coincide with that computed for the above comet.

"The following are the times and apparent paths of six of the more noteworthy meteors seen here, and if any of them have been observed elsewhere I shall be very glad to receive such details as were recorded. It need only be said with reference to the objects that No. 4 in the list was a splendid fireball, and that No. 5 is included on account of its exceedingly slow motion. No. 2 was not accurately observed, owing to its flight being partly intercepted by a building. Nos. 1 and 4 were directed from radiants far distant from that of Pons-Winnecke.

Meteors recorded June 28, 1921.

No.	G.M.T. h. m.	Mag.	From ° °	To ° °	Notes.	Radiant ° °
1	11 49	> ♃	236 + 48½	212 + 45¼	Rapid, streak	303 + 24
2	11 56	> 1	318 − 1	327 − 7½	Slow, white	? P.-W.
3	12 22	1	293 + 15	298 + 5	Slowish	P.-W.
4	13 18	5 × ♀	339 + 33	348 + 18	Slow	P.-W.
5	13 30	2	311 + 67	330 + 61	Very, very slow	P.-W.
6	13 34	♃	319 + 19½	312 + 2	Rapid, white	70 + 66

THE FIGURE OF THE EARTH.—An article on this subject by Prof. T. J. J. See (*Astr. Nach.*, Nos. 5103–4) is interesting as an historical summary of the progress of knowledge on the subject. Sir Isaac Newton recognised that the compression was considerably less than 1/230, the figure for equilibrium with a homogeneous fluid earth. The three chief methods have been (1) the measurement of arcs of latitude, (2) lunar perturbations, and (3) pendulum observations. In 1751 La Condamine published the value 1/303·6, deduced from measurement of arcs of latitude in France and Peru. In 1802 Bürg found the value 1/305·05 from method (2). These two values were surprisingly good for that early period, but still not entitled to any weight compared with modern determinations, although Prof. See assigns some to them. The figure 1/293·465 was published by Clarke in 1878, and generally superseded Bessel's value of 1/299·1528, although the latter now appears to be closer to the truth. In recent years methods (1) and (3), in the hands of Helmert, Hayford, Bowie, and others, have given very consistent results, from which the weighted mean 1/298·3 is deduced. Prof. See gives a useful table for obtaining geocentric latitude and radius vector on this assumption, and notes that in his opinion the value 1/294, adopted in Brown's Lunar Tables, is decidedly too large.